

33<sup>rd</sup> International Cotton Conference Bremen  
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**Session III: Cotton Quality, Properties and Testing**  
**8:30 March 17, 2016**

**Mr. Jean-Paul Gourlot, in the Chair**  
**CIRAD, Montpellier, France**

**Mona Qaud and Iris Biermann**  
**Uster Technologies, Uster, Switzerland**  
**“Managing a Spinning Mill with Quality in Mind.”**

Using modern sensing equipment, it is possible to measure, analyze and manage all aspects of the textile production process from fiber selection to yarn and fabric production. In order to manage the textile formation process efficiently resulting in high quality products, it is necessary to specify quality parameters, measure those parameters, find ways to control and improve the factors that affect the selected quality parameters, and then sustain the higher levels of efficiency and quality over time.

The Uster Tester 6 is a Total Testing Center for management efficiency and quality, including fiber quality, determination of laydowns, and yarn quality following article changes and maintenance. The Tester provides easily recognizable diagnostic information for every unit, process, machine and product in a mill.

As an example, nep removal efficiency is a classic indicator of the heart of the spinning mill, the carding process. Nep removal efficiency can be measured, and parameters for different cotton sources established. Limits can be established for each mill in each situation, depending on products being produced, and the cotton used. Efficiency measurements can be displayed in tabular or graphic form. Optimizations and quality comparisons are visualized easily. Uster has integrated yarn quality grades into predictable fabric quality results. Since fabric appearance is a key indicator for buyers, pilling performance and weaving performance are related to fabric grade. This enables a textile mill to relate yarn grade to fabric appearance.

In summary, the benefits are that the Tester can cover all data from fiber to yarn, it can provide a diagnosis of mill quality, data can be optimized on-line and off-line, and the Tester can all will allow a yarn prognosis to predict fabric outcome.

**Darryl Earnest**  
**USDA-AMS, Memphis, TN, USA**  
**“Innovations in USDA Cotton Classification.”**

USDA is developing new technologies to streamline and improve cotton quality testing while providing data to industry efficiently and quickly. It is imperative that testing instruments perform accurately and efficiently at all times. USDA currently operates 250 HVI 1000's in ten classing offices across the United States. A recent improvement was the implementation of Automated Micronaire over the last four years. Another key development is the capability to decouple the separate instrument cabinets, which allows USDA to reconfigure its instruments to improve efficiencies.

USDA is moving toward a more automated process of sample handling to improve speed and accuracy and to lower costs. The first fully-functional automated system was installed in the Abilene, Texas classing office at the start of 2015 and successfully handled over one million samples during the 2015/16 classing season. A second system has been installed in Memphis. The Abilene system moved samples from a loading and weighing station, to an instrument station for testing, and finally to a classer for visual inspection of extraneous matter. The objectives of automation are to optimize instrument performance and overall classing office efficiency. The automated sample handling system reduces the number of HVI instruments needed by nearly half and increased the number of samples tested per hour from 108 to 120 (an increase of 11%), while lowering labor and other operating expenses.

The automated sample handling system installed in Memphis will be operational in 2016, and even greater efficiencies are expected compared with the system prototype tested in Abilene.

USDA is working to implement a system using new lighting and imaging technology to enhance measurement ability for color and trash and to pursue the use of electronic detection of extraneous matter.

**Business Intelligence Analytics:** USDA is developing the capability to utilize data from known-value in-house cottons, along with live measurements, to provide immediate feedback on classing office performance and make adjustments.

**Quality Management Process:** USDA is using known-value cottons and materials, along with the current methods of in-house verification checks throughout each shift, to manage accuracy and precision in each office. The objective is to couple the known-value checks with business analytics software to give immediate real-time feedback. This allows for frequent ongoing checks in each classing office around the country, instead of sending cotton to Memphis overnight for retesting as is done during the current check-lot system. The quality management program (QMP) was tested in four classing offices in 2015 and will be utilized in all ten offices during 2016.

In the future, USDA will:

- Continue to work with instrument manufacturers to improve HVI equipment.
- Evaluate Beta models for three imaging prototypes.
- Advance toward full automation of cotton classification.
- Plan future classing office modifications and new offices around automation and business analytics.
- Leverage technology and analytics to identify areas for efficiency improvements in all facets of operations.

**Chris Delhom and James Rodgers**

**USDA-ARS Southern Regional Research Center, New Orleans, LA, USA**

**“Cotton Moisture: Importance in Practice and Suitable Measurement Options.”**

Measurement of cotton moisture is not easy. The variable nature of the fiber, the inclusion of non-lint content, and the presence of volatiles besides water all serve to confound the measurement of cotton moisture content. Seed cotton may be measured on the harvester by microwave sensors, such as the Vomax Model 760 (Vomax Instrumentation Pty. Ltd., Adelaide, Australia) in real-time during harvesting. Alternatively, a producer may utilize a

handheld electrically based moisture meter, such as the Delmhorst 52-E/C (Delmhorst Instrumentation Co., Towaco, New Jersey, USA), often using a cup shaped electrode to hold the seed cotton. If seed cotton moisture is to be measured in a laboratory, then an oven-drying method (Shepherd, 1972) or even a laboratory microwave-based method, such as the Aqua-Lab (Mesdan S.p.A., Brescia, Italy) is used.

At the gin, control systems such as the Intelligin (Uster Technologies AG, Uster, Switzerland) use electrically based sensors to measure moisture content during and after the ginning process. Many diverse systems, such as the Moisture Mirror and Tex-Max (Samuel Jackson Inc., Lubbock, Texas, USA) and the Vomax 851 (Vomax Instrumentation Pty. Ltd., Adelaide, Australia) can be used to monitor moisture content from the module through to the finished bale.

Numerous handheld instruments can be employed, with varying accuracy, to measure the moisture content of the final ginned and baled lint. The same laboratory environment methods that may be used on seed cotton are viable on ginned lint as well.

In the laboratory, drying the fiber at a specific time and temperature, better known as the oven drying moisture measurement method, remains the primary method used internationally (Montalvo, 2008). The oven method is a standard test method (ASTM D2495-07) and is largely based on the method developed by USDA (Shepherd, 1972).

There are several terms used to express the moisture present in fibers and yarns by the oven method, but the two primary terms are moisture content (MC) and moisture regain (MR). MC is calculated by determining the weight difference between the original fiber weight and dried fiber weight, then dividing that difference by the original fiber weight to obtain MC (%). MR is calculated by determining the weight difference between the original fiber weight and dried fiber weight, then dividing that difference by the dried fiber weight to obtain MR (%).

Although the oven method is the most common method, there are numerous moisture measurement methods in use internationally. These various moisture measurement techniques may be grouped into four categories: weight loss (gravimetric), chemical, spectroscopy, and electric.

An extensive comparative evaluation was performed on 15 instruments representing the four instrument groups (Rodgers, 2014). The small gravimetric weight loss units (oven and halogen lamps), the KFT instrument (chemical method), and the two NIR instruments (spectroscopy methods) yielded the best overall moisture method agreement. The inexpensive, hand-held, portable electric moisture instruments performed the worse, exhibiting the highest number of outliers overall.

**Daniela Messa and Sandra Meier**  
**Mesdan SpA, Puegnago del Garda, Italy, and Loepfe Brothers Ltd., Kempten, Switzerland**  
**“Comprehensive Cotton Testing to Obtain the Full Fiber Profile Relevant for the Preparation Process and the Yarn Quality.”**

The brand new Loepfe LabMaster® series with the instruments FIBERMAP® and YARNMAP® together with Mesdan CONTEST® set a new standard for laboratory measurements. The testing devices integrate the most important measurements into one system in order to complete the fiber profile throughout the whole preparation process of the spinning mill, from bale to finisher sliver. Apart from delivering the standard data known from cotton classification, detailed analysis of process relevant

fragments such as neps, seed coat neps, trash and stickiness are integrated. In addition, the test results obtained from the yarn testing instrument YARNMAP® can be directly linked through the data system LabMaster TOP® in order to achieve the most comprehensive analysis as basis for the decisions in the spinning mill. These innovative instruments are the most effective tools to measure the quality of fibers and yarn in the fastest, reliable and economic way. The instruments were presented at ITMA Milan 2015 for the first time.

## **Questions**

During Questions, members of the panel agreed that trade in cotton will increasingly be based on electronic data platforms, with special emphasis placed on accuracy, precision and fast provision of data. The better job the cotton industry can do to enable spinners to more easily use cotton, the better cotton can compete with manmade fibers. Electronic data will be used to trade cotton, manage inventories, and utilize cotton in mills. Measurement of additional fiber properties, such as neps and stickiness, will be utilized in cotton trade and utilization in the future.

The Quality Management Program tested by USDA in four test centers in 2015 will be expanded system-wide to all laboratories in 2016. USDA will continue to retest a small percentage of samples to assure continuity of test results in 2016.

USDA does not have plans to include measurements of stickiness in its quality testing program at this time because a reliable, rapid stickiness measurement is not available. If improved technologies are developed, and if U.S. cotton producers agree that stickiness should be added to the current list of testing metrics, then USDA might add such a measure in the future.

Polyester fibers also have large variances in quality parameters, but most instrument developers are not developing their machines for use on polyester.

Commercial weight is the actual weight of bales loaded into containers. Measurement of commercial weight is less important than two decades ago because the unscrupulous practice of adding moisture to cotton solely for the purpose of increasing weight has declined. Trade practices will determine whether bale weight measurements will be utilized more in the future than they are now. New technologies are available for rapid measurement of moisture in bales.

**The Chair thanked the speakers, the interpreters and the audience for their participation.**